BUDT 758K: Computer Simulation for Business Applications
Spring 2022 Syllabus

Instructor: Prof. Sujin Kim
E-mail: kimsj22@umd.edu
Office: Van Munching Hall, Room 4356
Office Hours: Tuesdays, 12:20-1:20 pm, VMH 2330

In-person office hours will be shared with students from other classes. The office hours will be restricted to those students who need direct help from Prof. Kim: some technical issues with software, some questions regarding lectures or any other matters relevant to this course. You may also ask some short questions about assignments and quizzes.

TA: Rishabh Nainani
E-mail: rnainani@umd.edu
Office Hours: Tuesday 6-7 pm, online
https://umd.zoom.us/j/8287949481

Course Meeting Dates
Course dates range from Jan 25 (T) to May 12 (Th), 2022.

Masking Policy in Classroom:
University policy *requires that masks be worn over the nose and mouth while indoors at all times, regardless of vaccination status.* Students not wearing a mask will be given a warning and asked to wear one, or will be asked to leave the classroom immediately. Students who have additional issues with the mask expectation after a first warning will be referred to the Office of Student Conduct for failure to comply with a directive of University officials. For the most updated COVID-19 information for UMD can be found at https://umd.edu/4Maryland.

Course Description: This course covers the methods for computer simulation modeling and analysis of complex systems. Students are assumed to have been introduced to the basic techniques and applications in the field of operations management and business analytics. Course emphasis is on modeling of real-world systems (for example, inventory or queuing systems), implementing simulations in special purpose software, and analyzing simulation results.

Time Expectations: Each week, in addition to any scheduled class time, you should expect to spend 2-3 hours reviewing lecture materials, taking quizzes, and completing learning activities. This time does not include regular homework such as reading the text, completing problems, and studying.

Prerequisites: A basic understanding of probability and statistics (equivalent to BUDT730). Exposure to computer programming (e.g., MATLAB, Python, R, etc.) is useful, but is not required.

Course Objectives: At successful completion of this course, students will be able to:

- Identify an underlying analytical *structure* in a seemingly complex and amorphous decision problem.
- Translate a verbal description of a decision problem into a valid simulation model.
- Interpret the meaning and assess the validity of a particular simulation model.
- Understand the role of *uncertainty* and *risk* in the decision-making process.
- Use of Simulation models to assess risk.
- Build and run Monte-Carlo Simulation using @RISK.
- Build and run discrete event simulation models using ARENA
- Perform sensitivity analysis by tracing the effects of varying a parameter on the decision variables and

Course Outline
1. Introduction to Simulation
2. Spreadsheet Simulation
3. Conceptual Modeling
4. Introduction to Arena
5. Input Analysis
6. Random Variable and Variate Generation
7. Intermediate Arena
8. Output Analysis

Textbook
Simulation with Arena, 6th ed.
W. David Kelton, Randall P. Sadowski, and Nancy Swets
McGraw-Hill Science/Engineering/Math
ISBN-13: 978-0073401317 (6th ed.)

Course Webpage: Canvas course page, accessible at elms.umd.edu. The course handouts, homework, solutions, and other course materials will be posted on the website. The course website must be used to submit homework assignments; see 'Homework Assignments' for the details.

Distribution of Course Materials
Course materials, including lectures, presentations, handouts and exams, should not be copied or distributed except when they are used for academic purposes or you have received expressed written permission from the instructor.

Software: We will use **@RISK and Arena Simulation Software Version 16.10** in this class. All of this software will also be available on vSmith for free use.

- **@RISK and Palisades Decision Tools Suite:** @RISK is a part of Palisade Decision tools package. A to-do for all students using Windows PC before they come to the first class is to download the Palisades software and install it on your computer. The file is available on Canvas. Resources for these tools are also provided on Palisades website: http://www.palisade.com/QuickStart/. It is available to download at Canvas. Palisades Decision Tools Suite is only Windows-compatible; therefore, Mac OS users will need to access the tools via vSmith (http://workspace.rhsmith.umd.edu) or by installing a virtual instance of Windows on their machines. The University of Maryland provides licenses to students for VMWare Fusion, which is a virtualization software package that can be used to run Windows (and any other operating system) in Mac OS. Alternatively, you could use Boot Camp (included in Mac OS), VirtualBox (open source), or Parallels Desktop 8, but these options will require more effort (or money) on your part to configure.

- **Arena Simulation** is available to download at Canvas. Arena Simulation Software is only Windows-compatible; therefore, Mac OS users will need to install a virtual instance of Windows on their machines.

Grading and Deliverables
Your final grade will be determined according to the following scale:

- Homework assignments: 30% (8 individual and group assignments)
- Short quizzes and class participation: 10%
- Midterm Exam: 25% **(In class, Thursday, March 17, 11:00 am -12:15 pm**)
- Final Exam: 35% **(TBA)**

Students who earn at least 90% will earn at least an A-, at least 80% will earn at least a B-, and so on. Final grade distribution in the class will be curved and follow the guidelines set forward by the school.

Please note that **no extra credit** will be given at any point in time throughout the semester.

All assessment scores will be posted on the course ELMS page. If you would like to review any of your grades (including the exams), or have questions about how something was scored, please email me to schedule a time for us to meet in my office. Any formal grade disputes must be submitted in writing and within one week of receiving the grade.

Homework Assignments
All homework assignments must be submitted to Canvas. Any assignments submitted via email will not be accepted. Please type up your homework assignments using Microsoft Word or whatever other package you use for word processing. When you submit your word files, spreadsheets, Arena model files or any other files involved in the homework , you should design them according to the instructions for the problem so that they are easy to follow. Otherwise, some points will be deducted. Because it is important to keep the course on track, late homework cannot be accepted.

When doing the homework, you must make and submit your own work. You may not share word documents, spreadsheets, Arena models or any other files involved in the homework. Create new files each time. Do not modify your old file. Keep all the homework files until you receive the final letter grade.

<u>All assignments will count towards your final grade.</u>

There will be 8 assignments. All assignments will be due on Wednesdays at 11:59 pm. A<u>ny late homework after that time will not be accepted.</u>

Quizzes
A number of quizzes will be given throughout the semester; in-class paper quizzes and online quizzes via Canvas. <u>No make-up quiz will be given</u>. The class participation will be individually graded by an instructor.

Using Personal Computers in Class
Bring your PC to every class so that you can be ready to use simulation software, download course materials, and take Canvas online quizzes in class. You are not allowed to use your computer for other use.

Consulting the Teaching Assistant

A Graduate Teaching Assistant is available for consultation in each homework due week. You can also make an appointment with him via email. The TA will not provide any direct help on course project, but he can share his experience and give you some advice.

Tips on Studying for This Course

- **Attendance**
  Do not miss any class meetings – given the cumulative nature of most sessions, it is usually impossible to adequately make up a missed session.

- **Reading**
  Please complete the assigned reading for each class. Otherwise, the pace will seem too fast.

- **Individual Study or Study Groups?**
  I recommend both. Informal study groups (which could be different from the groups that are used for the group assignments) can be an efficient way to learn, thereby saving you much time and frustration. However, it is important to choose a study group that enables the development of your *individual* analytical skills. It is not enough to simply follow what others are doing.

- **Software skills**
  We will implement several simulation models in class. It is very important to master each example/model to keep up with the course. If you have any difficulties in learning software and skills, I recommend to consult me and the TA, instead of searching for online resources.

Course Policies
University Class Policies
Students are responsible for knowing their rights and reviewing all course related policies found at this link to **UMD's Office of Undergraduate Studies website** or **UMD's Graduate Schools list of Course Policies.**

Resources & Accommodations

Accessibility and Disability Services

The University of Maryland is committed to creating and maintaining a welcoming and inclusive educational, working, and living environment for people of all abilities. The University of Maryland is also committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of the University, or be subjected to discrimination. The **Accessibility & Disability Service (ADS)** provides reasonable accommodations to qualified individuals to provide equal access to services, programs and activities. ADS cannot assist retroactively, so it is generally best to request accommodations several weeks before the semester begins or as soon as a disability becomes known. Any student who needs accommodations should contact me as soon as possible so that I have sufficient time to make arrangements.

For assistance in obtaining an accommodation, contact Accessibility and Disability Service at 301-314-7682, or email them at **adsfrontdesk@umd.edu**. Information about **sharing your accommodations with instructors**, **note taking assistance** and more is available from the **Counseling Center**.

Student Resources and Services

Taking personal responsibility for your own learning means acknowledging when your performance does not match your goals and doing something about it. I hope you will come talk to me so that I can help you find the right approach to success in this course, and I encourage you to visit **UMD's Student Academic Support Services website** to learn more about the wide range of campus resources available to you.

In particular, everyone can use some help sharpening their communication skills (and improving their grade) by visiting **UMD's Writing Center** and schedule an appointment with the campus Writing Center.

You should also know there are a wide range of resources to support you with whatever you might need (**UMD's Student Resources and Services website** may help). If you feel it would be helpful to have someone to talk to, visit **UMD's Counseling Center** or **one of the many other mental health resources on campus**.

Basic Needs Security

If you have difficulty affording groceries or accessing sufficient food to eat every day, or lack a safe and stable place to live, please visit **UMD's Division of Student Affairs website** for information about resources the campus offers you and let me know if I can help in any way.

Technology Policy

Please refrain from using cellphones and other electronic devices during class sessions unless we have designated such use as part of a class exercise.

Attendance and Participation

- Given the interactive style of this class, participation will be crucial to learning and your performance in this class. Attendance is particularly important also because class discussion will be a critical component for your learning.

- Each student is expected to make substantive contributions to the learning experience, and attendance is expected for every session.

- Students with a legitimate reason to miss a live session should communicate in advance with the instructor, except in the case of an emergency.

- Students who miss a live session are responsible for learning what they miss from that session.

- Additionally, students must complete all readings and assignments in a timely manner in order to fully participate in class.

Absences and Late Policy

Late assignments require prior permission from the instructor and must be accompanied by a legitimate reason for not meeting a target deadline.

The complete university policy on absences can be found here.

As per university policy, one missed class with an email notification (preferably before) is acceptable. For absences longer than 1 class session, or more than twice in the semester, documentation is required. With appropriate documentation students will be given (add in your policy here e.g. 1 week from documentation to take the assignment and ½ points for 2 weeks after documentation receipt.)

Academic Integrity

The University's **Code of Academic Integrity** is designed to ensure that the principles of academic honesty and integrity are upheld. In accordance with this code, the Smith School does not tolerate academic dishonesty. Please ensure that you fully understand this code and its implications because all acts of academic dishonesty will be dealt with in accordance with the provisions of this code. All students are expected to adhere to this Code. It is your responsibility to read it and know what it says, so you can start your professional life on the right path. **As future professionals, your commitment to high ethical standards and honesty begins with your time at the Smith School.**

It is important to note that course assistance websites, such as CourseHero, are not permitted sources for Smith School courses, unless the instructor explicitly gives permission for you to use one of these sites. Material taken or copied from these sites can be deemed unauthorized material and a violation of academic integrity. These sites offer information that might not be accurate and that shortcut the learning process, particularly the critical thinking steps necessary for college-level assignments.

Additionally, it is understandable that students may use a variety of online or virtual forums for course-wide discussion (e.g., GroupME or WeChat). Collaboration in this way regarding concepts discussed in this course is permissible. However, collaboration on graded assignments is strictly prohibited unless otherwise stated. Examples of prohibited collaboration include: asking classmates for answers on quizzes or exams, asking for access codes to clicker polls, etc.

Finally, on each exam or assignment you must write out and sign the following pledge:

"I pledge on my honor that I have not given or received any unauthorized assistance on this exam/assignment."

To help you avoid unintentional violations, *the following table* lists levels of collaboration that are acceptable for each type of assignment. If you ever feel pressured to comply with someone else's academic integrity violation, please reach out to me straight away. Also, *if you are ever unclear* about acceptable levels of collaboration, *please ask*!

	OPEN NOTES	USE BOOK	SEARCH ONLINE	ASK FRIENDS	WORK IN GROUPS
Quizzes	✓	✓	✗	✗	✗
Individual Assignments	✓	✓	✗	✗	✗
Individual Assignments	✓	✓	✗	✗	✓
Exams	1 sheet of notes (the form is available at Canvas)	✗	✗	✗	✗

Course Evaluation

Please submit a course evaluation through CourseEvalUM in order to help faculty and administrators improve teaching and learning at Maryland. All information submitted to CourseEvalUM is confidential. Campus will notify you when CourseEvalUM is open for you to complete your evaluations for fall semester courses. Please go directly to the **Course Eval UM website** to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing through Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

Copyright Notice

Course materials are copyrighted and may not be reproduced for anything other than personal use without written permission.

Classroom Etiquette:

Please follow the classroom etiquette:

1. Be on time for class. Be aware that lateness can be a rude and disruptive form of behavior, especially when it is accompanied by doors opening and shutting, loud noises, and passing in front of the instructor. If you are late, sit in a chair as close to the door as possible and avoid disruptive behavior.

2. Do not plan to leave class early. If you must, sit close to the door and leave with minimum disruption.

3. No talking or whispering to other students. A persistently disruptive students will be asked to leave the classroom; see the note below.

4. Turn off any cell phones.

5. Attend your section. If you need to attend the other section, at least 24 hours' advance notice is required to get my permission. If you take your quiz in the other section without permission, you may not receive full credit.

About Instructor

Sujin Kim is a Clinical Associate Professor of Operations Management in the Robert H. Smith School of Business at the University of Maryland. She received her Ph.D. in Operations Research from Cornell University. Before she joined the Robert H. Smith School of Business, she was a Visiting Assistant Professor in the Department of Industrial Engineering at Purdue University and an Assistant Professor at the National University of Singapore. Her research concerns simulation methodology and stochastic simulation-based optimization, with applications in electric power and health service system. Her work has been published in Mathematics of Operations Research, SIAM Journal on Optimization, ACM Transactions on Modeling and Computer Simulation, Journal of Quality Technology, Applied Energy, and IIE Transactions.